Fluidity and legitimacy: Designer as Minor Scientist

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Keywords

Deleuze and Guattari, Royal Science, Minor Science, Levi-Strauss, Bricolage, Human Computer Interaction, User Experience Research

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In the field of Human Computer Interaction, user experience research has been characterized in two camps, ***model-based*** and ***design-based***. These groups have contrasting approaches to measurement and evaluation. Through spotlighting the areas of 'reduction', 're-prioritising' and 'following', we argue that the model-based and design-based camps can be constructed in terms of the philosopher Gilles Deleuze & the psychotherapist and semiotician Felix Guattari's ***royal science*** and ***minor science*** respectively. Via focusing on the commonly-used ethnographic method termed 'cultural probing', we argue that the relationship between Deleuze & Guattari's philosophies of science provide insights into the nature of legitimacy within contemporary Human Computer Interaction research practice. Parallels exist between Deleuze & Guattari's philosophies and the anthropologist Claude Levi-Strauss's concepts of ***bricolage*** and ***engineering***. Design-based user experience research practitioners use the notion of bricolage to contextualize their practice. We find flaws with the use of Levi-Strauss' philosophies of science in qualitative investigation for we argue his description of bricolage has been misinterpreted by influential researchers in this community. Rather than employing Levi-Strauss' concepts, we propose that Deleuze & Guattari's idea of ***flux*** is key to enabling the Human Computer Interaction community to contextualize trends and shifts in

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Introduction

Over the last decade the focus of study in Human Computer Interaction (HCI) has shifted from usability to user experience (UX) (e.g. Law, 2011; Bargas-Avila & Hornbæk, 2011). Law (2011, p.4) has divided UX research into "roughly" two catchments, "model-based UX research[ers]" and the "design-based UX research camp". The former use intellectual methods derived from usability practitioners when interpreting qualitative human data for measurement (Law, 2011). The latter (who Law also terms the *holistic camp*) characteristically criticize traditional, scientistic research methods (e.g. Sengers 2010; Gaver, Boucher, Pennington, & Walker, 2004). Accordingly, the latter camp "defy the measurability of UX" (Law, 2011, p. 1). Researchers associated with the former group "include Hassenzahl, Mahlke, Sutcliffe, Tractinsky, and van Schaik"; practitioners grouped with the latter "include [the second author], Cockton, Forlizzi, Gaver, McCarthy, Monk and Wright" (Law, 2011, p. 1). Law (2011), along with the majority of UX researchers, belongs to the model-based camp. This paper argues that the model-based and design-based

groups can be viewed in terms of ***royal science*** and ***minor science*** as characterized by the philosopher Gilles Deleuze and the psychotherapist and semiotician Felix Guattari (2004). We begin by outlining Deleuze & Guattari's philosophies of science. Parallels exist between Deleuze & Guattari's descriptions of royal science and minor science and the anthropologist Claude Levi-Strauss's concepts termed ***bricolage*** and ***engineering***. This research moves on to sketch the commonalities between Deleuze & Guattari's notions and those of Levi-Strauss. It then reflects on the notion that qualitative researchers from a diverse range of areas have claimed that their approach mirrors that of the bricoleur. One such area is HCI for design-based UX research practitioners use the idea of bricolage to contextualize their practice. This paper summarizes the use of bricolage amongst HCI UX investigators. This paper then describes flaws with the use of Levi-Strauss' concept in the area of qualitative research, focusing on the notion that Levi Strauss' description of bricolage has been misinterpreted by influential qualitative investigators. Upon rejecting the use of bricolage, this paper concentrates on using Deleuze & Guattari's notions as a lens through which to view HCI UX research. Through spotlighting the areas of 'reduction', 're-prioritising' and 'following', this research argues that the model-based and design-based camps can be constructed in terms of royal science and minor science respectively. This paper then illustrates how the commonly-used ethnographic 'minor scientific' method termed 'cultural probing' provides insights into the nature of legitimacy in current HCI UX research practice. It concludes by proposing that Deleuze & Guattari's notion of ***flux*** is key to enabling the HCI community to contextualize trends and shifts in debates in UX research practice.

Deleuze & Guattari: Royal and Minor Science

Deleuze & Guattari's (2004) work covers a vast range of intellectual territory. Their difficult and provocative text *A Thousand Plateaus* narrates the relationship between two theoretical models, royal science and minor science. These concepts can be thought of as 'worldviews' presenting dichotomous readings of notions as diverse as space, time and matter. Consequently, problems concerning theory and practice are "brought out and resolved in an entirely different way" (*ibid*, p. 405) in both schemas.

Royal science is the dominant model and is legitimised through being "established by history" (*ibid*, p. 398). Deleuze & Guattari claim its endeavours are functions and expressions of the State and thus also refer to royal science as *state science*. Royal science continually attempts to order and homogenise heterogeneous space and exists to "extract […] constants from variables" (*ibid*, p. 407). It measures everything, marking matter with increments developed through using maxims of its own creation. Deleuze & Guattari's term for this process is 'striation' (in the sense of striking or striping), stating royal science "striates all of space in all of its directions" (*ibid*, p. 408). Royal science homogenises matter to make it fit into specified theoretical models. Through this it ultimately aims to construct universal laws. In contrast, minor science retains the variation of variables and thus facilitates the existence of heterogeneous space. Minor science occupies an expanse "without 'counting' it" (*ibid*, p. 409). Thus, in opposition to striated space, Deleuze & Guattari characterize the expanse occupied by minor science as being 'smooth'. Unlike the processes of royal science, the models of minor science do not reduce matter. And instead of

attempting to create universal laws, minor science conveys the singularities of space and matter.

Deleuze & Guattari describe minor science as a *nomad* or *ambulant* schema. They do this because its processes decree the idiosyncratic flow of matter should be—in their terms—*followed*. Space, for the minor scientist "can be explored only by legwork" (*ibid*, p. 409). An artisan wishing to craft a wooden object must "…go to find the wood where it lies, and to find the wood with the right kind of fibers" (*ibid*, p. 451). This trait continues when he is back in his workshop for he cannot plane across the grain of the timber; he must instead work with it. Thus, rather than forcing timber to submit to models of his discipline's creation, the artisan must "…follow the wood, fibers of the wood" (*ibid*, p. 451).

As the dominant model, royal science persistently imposes itself on the processes of minor science, "submit[ting] them to its own model, and allow[ing] them to exist only in the capacity of 'technologies' or 'applied sciences'" (*ibid*, p. 411). However, Deleuze & Guattari claim factions of the ambulant sciences refuse to be internalised by royal science – this notion is significant to discussion related to legitimacy in contemporary HCI discourse and will be expanded upon later on in this paper.

Though royal science and minor science operate via dichotomous processes and in oppositional spaces, Deleuze & Guattari do not presuppose the existence of steadfast boundaries between them. Rather, the notion of flux between royal and minor science is integral to their description. The following discussion on the scientific field of chemistry serves to illustrate this. Individuals acting within the royal

scientific schema include those usually identified as *scientists*, such as chemists. For Deleuze & Guattari, disciplines or methodologies do not necessarily permanently belong to either the royal or minor scientific model. As an example, “chemistry” once conformed to the minor science schema and,

> “became a royal science only by virtue of a whole theoretical elaboration of the notion of weight”.
>
> (Deleuze & Guattari, p. 408)

The premise of *flux* between Deleuze & Guattari’s sciences will become important when this discussion turns to notions of legitimacy in UX research.

Parallels exist between Deleuze & Guattari’s notions and the concepts of ***bricolage*** and ***engineering*** as developed by the anthropologist Claude Levi-Strauss (1972). HCI qualitative investigators have used Levi-Strauss’ philosophy of science to contextualize UX research practice (e.g., Yee, 2012; Fincher, Tenenberg & Robins, 2011; Teoh, Wickramasinghe & Pan, 2012; Morrison, Viller & Mitchell, 2011). This paper finds flaws with the often-argued link between Levi-Strauss’ work and qualitative research. Instead it suggests that Deleuze & Guattari’s ideas may be a more appropriate method of contextualizing UX research practice. There follows a brief outline of Levi-Strauss’ theories in relation to Deleuze & Guattari’s philosophies of science.

Levi-Strauss: Bricolage and Engineering

The French structuralist Claude Levi-Strauss (Smircich, 1983) has been called *The Father of Anthropology* (Wilcken, 2012). Writing prior to Deleuze & Guattari (2004), Levi-Strauss—in his seminal text *The Savage Mind* (1972, p. 15)—identifies "two distinct modes of scientific thought", *bricolage* and *engineering*. Like Deleuze & Guattari, Levi-Strauss does not envisage his two schemas as representing different stages of cerebral development, rather as different methods of conceptualizing problems developed in different eras in the history of humanity:

> "It is as if the necessary connections which are the object of all science, Neolithic [bricolage] or modern [engineering], could be arrived at by two different routes…" (Levi-Strauss, 1972, p. 15)

Parallels exist between the methodologies employed by the engineer and the royal scientist. Like the latter, the former is reductive in his practice. For example, the chemist (an engineer by affiliation), "reduces the variety of tastes and smells to different combinations of five elements" (Levi-Strauss, 1972, p. 12). The decidedly ordered method of practice employed by the engineer is comparable to that of the royal scientist. The following excerpts from Levi-Strauss' text illustrate the engineer's mode of operation. He creates,

> "…events (changing the world) by means of structures…"
>
> (Levi-Strauss, 1972, p.22, Original Emphasis)

And shows,

> "…reticence in pronouncing on questions whose answers have not been rehearsed".
>
> (Levi-Strauss, 1972, p.20)

The engineer's *structures* parallel the royal scientist's already noted *forms*. And the former's *events* mirrors the latter's *matter*. Consequently, the engineer's conduct echoes the royal scientist's belief in "a form that organizes matter" (Deleuze & Guattari, 2004, p. 407).

Resonance exists too between Levi-Strauss' description of bricolage and Deleuze & Guattari's characterization of minor science. The act of bricolage is carried out by the bricoleur. Like the minor scientist, the bricoleur maintains heterogeneity in his work, for:

> "…the rules of his game are always to make do with 'whatever is at hand', that is to say with a set of tools and materials which is always finite and is also heterogeneous…"
>
> (Levi-Strauss, 1972, p. 17, Original Emphasis)

There is also a parallel between how both the bricoleur and the minor scientist use materials. The following excerpt illustrates how the bricoleur makes use of a piece of timber:

> "A particular cube of oak could be a wedge to make up for the inadequate length of a plank of pine or it could be a pedestal – which would allow the grain and

> polish of the old wood to show to advantage. In one case it will serve as extension, in the other as material. But the possibilities always remain limited by the particular history of each piece…"
>
> (Levi-Strauss, 1972, pp. 18-19)

Thus, in devising a use for timber the bricoleur must *follow* the history of the wood just as the minor scientist must follow its grain when planing it.

The influence of Levi-Strauss' work has spread beyond the field of anthropology. In recent times, a host of qualitative researchers from a diverse range of area have claimed that their approach mirrors that of the bricoleur (e.g., Caverhill, 2002; Denzin & Lincoln, 1994; Riches & Dawson, 2002; Di Domenico, Haugh & Tracey, 2010; Kincheloe, McLaren & Steinberg, 2004). Bricolage is of relevance here as it is advocated as a valid approach to qualitative research in design and HCI (e.g. Yee, 2012; Fincher, Tenenberg & Robins 2011; Teoh, Wickramasinghe & Pan, 2012; Morrison, Viller & Mitchell, 2011). Bricolage is promoted by many qualitative researchers as a method which challenges scientistic paradigms. 'Design-based UX research practitioners' can be characterized as one such set of researchers (Law, 2011).

This paper argues that the notion of bricolage does not adequately account for the wider methodological shifts in practice in the field of qualitative research. Rather than constructing design-based UX researchers as bricoleurs, this discussion draws a parallel between these investigators and Deleuze & Guattari's minor scientists. To defend this position, this paper moves on to (1) sketch the related wider context of

shifts in method in the field of qualitative research in recent times, (2) summarise the claimed connection between qualitative research and bricolage, before (3) justifying why Deleuze & Guattari's philosophy offers a more appropriate contribution to the field of HCI UX research practice than does the theory of Levi-Strauss.

Qualitative Research

Qualitative Research in Context

Research methods developed by qualitative investigators can be seen as either adhering to or reacting against values concomitant with the physical sciences. Scientific research principles became established in the physical sciences (Kerlinger, 1970). These values are formulated upon the ideals of neutrality, objectivism, universalism, realism and representationalism (Kincheloe, McLaren & Steinberg, 2004). Borg (1963) argues quantitative scientific research to be the most successful means of discovering truth about natural phenomena. This account of an evolutionary progression in the objectivity of empirical inquiry is challenged by influential philosophers of science (Kuhn, 2012; Foucault, 1971).

Criticism of empirical methodology comes to the fore in the study of human beings. The controversy over method is eloquently expressed by a William Hingest, a character in *That Hideous Strength*, a novel by C.S. Lewis:

> "I happen to believe that you can't study men; you can only get to know them, which is quite a different thing".

(Lewis, 1996, p. 69):

The study of acting subjects is far more difficult to predict and systematise than the study of physical objects. Thus, many researchers utilize qualitative practices when investigating human behavior. However, the perceived lack of a systematic approach leaves qualitative researchers open to criticism:

> “Qualitative methods are frequently viewed as failing to achieve or make explicit rules for achieving reliability, validity, and objectivity – criteria of adequacy or rigor in scientific research”.
>
> (Sandelowski, 1986: 27)

Up until the 1990s, most general books on research methods ignored qualitative inquiry (Bryman and Burgess, 1994). During this decade, texts which focussed on qualitative research techniques emerged (e.g. Strauss & Corbin, 1990; Bryman & Burgess, 1994). Strauss and Corbin’s book (*ibid*) has influenced how qualitative researchers worldwide engage in practice (Charmaz, 2010). Aware of the criticism of the validity of qualitative study, Strauss and Corbin are careful to underscore the rigour of their method:

> "we develop each category (phenomena) in terms of the causal conditions that give rise to it, the specific dimensional location of this phenomena in terms of its properties, the context, the action, interactional strategies used to handle, manage, respond to this phenomena in light of that context and the consequence of any action/interaction that is taken."

(Strauss and Corbin, 1991, p. 114, Original emphasis)

Although Strauss & Corbin concentrate on qualitative rather than empirical investigation, their method appears to recognize the overarching status of the physical sciences. Strauss and Corbin's claim to legitimacy is underscored by their adherence to distance and neutrality, both long-established values in the physical sciences:

> "Objectivity enables the researcher to have confidence that his or her findings are a reasonable, impartial representation of a problem under investigation…"
>
> (Strauss & Corbin, 1991, p. 53)

Similarly observant of physical science research idioms, Bryman & Burgess (1994, p. 4) suggest that qualitative data is open to systematic processing:

> "Appropriate cases are examined and a possible explanation is formulated and the investigator then examines further appropriate cases to establish how well the data collected fit the hypothetical explanation."
>
> (Bryman and Burgess, 1994, p. 4)

The observance of values concomitant with empirical science is not universal amongst qualitative researchers. There exists a strand which reacts against principles developed in the physical sciences. The last decade or so has seen an increase in the presence of such researchers within the field of qualitative research. Defending this position, Riches & Dawson claim:

> “We have neither found, nor offer, any single model or foolproof approach to discovering the ‘correct’ explanation... What we have found is a range of views – conceptual tools – that each contribute something to our understanding”.
>
> (Riches & Dawson, 2002, p. 210)

Similarly, Charmaz (2010, p. 10) argues her approach:

> “...explicitly assumes that any theoretical rendering offers an *interpretive* portrayal of the studied world, not an exact picture of it”.
>
> (Charmaz, 2010, p. 10, Original Emphasis)

Charmaz criticises the formulaic nature of Strauss and Corbin’s (ibid) method. Instead, she argues for:

> ‘...flexible guidelines, not methodological rules, recipes, and requirements’.
>
> (Charmaz, 2010, p. 9)

The above calls for flexibility and perspectivism through interpretation are far removed from the ideals set down in the physical sciences. There exists a body of qualitative research literature which has sought to develop a relationship between investigators rejecting principles associated with the physical sciences and the philosophies of science developed by Claude Levi-Strauss. Earlier, it was noted that Levi-Strauss (1972, p. 12) claims the physical science of chemistry falls within the remit of his description of engineering. Rather than adhering to the values associated

with Levi-Strass' engineer, some qualitative investigators claim their practice to be analogous to the engineer's dichotomous opposite, the bricoleur. Below, this claimed link is explored.

The Influence of Levi Strauss: Qualitative Research and Bricolage

The field of qualitative research has witnessed some practitioners turning away from traditional research paradigms, rejecting, for example, "the quest for some naive concept of realism..." (Kincheloe et al., ibid, p.168). Kincheloe et al. (*ibid*, p. 167-173) argue that, in a push to become "critical", some qualitative researchers have adopted Levi-Strauss' concept of bricolage to describe their practice. Advocates of bricolage claim this method is ideal for investigating the contemporary era:

> "...our theoretical assumptions, our approach, and certainly our methods of data collection and analysis fully reflect the post-modern condition that we have attempted to explore".
>
> (Riches & Dawson, 2002, p. 210)

Several points appear to be important in discourse on bricolage within the area of qualitative research. Below, these areas are summarised. According to Di Domenico, Haugh & Tracey, (2010, p. 698) "making do, the refusal to be constrained by limitations, and improvisation" underpin the bricolage literature. The traits of *making do* and *improvisation* are emphasised in the bricoleur's recourse to use "whatever is at hand to deal with the current 'task'" (Gobbi, 2005, p. 119, Original Emphasis). The trait of *not being constrained by limitations* is accentuated by Caverhill (2002, p. 205)

who argues that the qualitative researcher-cum-bricoleur has “diverse ways of understanding” at his disposal. Fincher, Tenenberg & Robins (2011, p. 32) highlight the bricoleur’s *flexibility* by claiming practitioners are able to “piece together new tools or techniques.” Equally, the researcher-cum-bricoleur’s *reflexivity*,is underscored in the literature. Denzin & Lincoln (ibid, p. 6) argue the bricoleur’s “reflexive collage like creation […] represents the researcher’s images, understandings, and interpretations of the world”. This reflexivity enables bricoleur-like researchers to grow as professionals for it “promotes the expansion of one’s critical consciousness” (Warne & McAndrew, 2009, p. 857). Research also suggests that bricoleur-like investigation is characterised by it being *ongoing* in nature. On this point, Riches and Dawson (*ibid*, p. 210) argue their “...findings are eclectic, partial, and inevitably superficial at times.” For Kincheloe et al. (*ibid*, p. 171), the *ongoing* nature of bricolage-style research is reflected in the very definition of the term bricolage, for “no description is fixed and final.”

The Handbook of Qualitative Research, edited by Kincheloe et al. (ibid), has been very influential in disseminating the idea that qualitative research practice can be viewed as a bricolage. Kincheloe et al. (ibid) claim the way they approach the materials with which they work reflects the practices employed by the bricoleur. To illustrate this point, it is important to reiterate that the bricoleur’s work is defined by the nature of the material he uses:

> “the possibilities always remain limited by the particular history of each piece…”
>
> (Levi-Strauss, 1972, p. 19)

Similarly, the qualitative researcher-cum-bricoleur acknowledges his studies are bound by the situated nature of his research environment:

> "...the bricolage highlights the relationship between a researcher's way of seeing and his or her personal history."
>
> (Kincheloe et al, *ibid*, p.168)

In addition, qualitative researchers' interest in bricolage is linked to the notion of *unexpectedness*. To expand on this, it is necessary to turn to Levi-Strauss' etymology of the term:

> "In its old sense the verb 'bricoler' applied to ball games and billiards, to hunting, shooting and riding. It was however always used with reference to some extraneous movement: a ball rebounding, a dog straying or a horse swerving from its direct course to avoid an obstacle." (1972, p. 16)

Bricolage then is historically bound with what might be termed *unexpected movements*. Indeed, compared with those of a craftsman, the bricoleur's actions are "devious" (Levi-Strauss, 1972, p. 16)**.** *Unexpectedness* appears to be an integral part of Kincheloe et al.s' (ibid, p. 168) description of the researcher-cum-bricoleur's approach to practice,

> "Researchers' interaction with the objects of their inquiries, bricoleurs understand, are always complicated, mercurial, unpredictable..."

As noted, within the community of qualitative investigators identifying with the bricoleur there are design-based UX research practitioners contributing to the areas of HCI. This paper moves on to discuss problems with the link between qualitative research and bricolage. We will argue that Levi Strauss' description of bricolage has been misinterpreted by influential qualitative investigators.

The Rejection of Levi-Strauss' Philosophies of Science in Qualitative Research Practice.

Kincheloe et al. (*ibid*) identify bricolage as a means of enabling investigators to disrupt the dominant paradigm of research on human beings—that concomitant with the employment of objective empirical methodology. Accordingly, Kincheloe et al. (*ibid,* p. 167) "identify the bricolage as an emancipatory research construct". The potential power of bricolage in creating disruption and affecting political change is supported by the following claim:

> "…bricoleurs attempt to remove knowledge production and its benefits from the control of elite groups [….] Rejecting this normalized state of affairs, bricoleurs commit their knowledge work to helping address the ideological needs and informational needs of marginalized groups and individuals".
>
> (Kincheloe et al. (*ibid*), p.169)

To reflect on Kincheloe et al's (*ibid*) claim of the potential influence of the bricoleur it is necessary to return to Levi-Strauss' (1972) characterization of the bricoleur and the engineer. When it comes to undertaking his activities, the bricoleur is limited by the materials at his disposal:

> “His first practical step is retrospective. He has to turn back to an already existent set made up of tools and materials, to consider or reconsider what it contains and, finally and above all, to engage in a sort of dialogue with it and, before choosing between them, to index the possible answers which the whole set can offer to his problem.”
>
> (Levi-Strauss’, 1972, p.18)

In comparing the actions of the bricoleur and the engineer, Levi-Strauss claims the latter’s are also inherently affected by resource-related limitations:

> “The engineer no doubt also cross-examines his resources […] his means, power and knowledge are never unlimited and that in this negative form he meets resistance with which he has to come to terms”.
>
> Levi-Strauss’ (1972, p.19)

Levi-Strauss (1972) does not argue that the availability of technological or physical tools differentiates the bricoleur and the engineer. Instead, he claims the *mind-set* of the two protagonists sets them apart:

> “It might be said that the engineer questions the universe, while the ‘bricoleur’ addresses himself to a collection of oddments left over from human endeavours […] the engineer is always trying to make his way out of and go beyond the constraints imposed by a particular state of civilization while the ‘bricoleur’ by inclination or necessity always remains within them”.

(Levi-Strauss', 1972, p.19, (Original emphasis)

From Levi-Strauss' description it is evident that the *engineer's* approach is **more suited** to precipitating change in society than the methods employed by the bricoleur. Kincheloe et al's (*ibid*) claim of the potential influence of the bricoleur is therefore at odds with Levi-Strauss' description of bricolage. Paradoxically, the *engineer's* position has more in common with the aims of researchers-cum-bricoleurs than does the locus of the bricoleur. As noted earlier, Levi-Strauss' engineer is a physical scientist. Researchers-cum-bricoleurs who seek alternative values to those of the physical sciences may then be heading towards an epistemological dead end. This paper calls for a re-evaluation of the use of bricolage as a means of contextualizing qualitative research practice. With specific relevance to HCI UX research practice, this paper moves on to discuss why constructing design-based UX researchers as minor scientists provides a more powerful epistemology.

UX Research Practice: Deleuze & Guattari VS Levi-Strauss

As noted, with regard to their respective philosophies of science, both Deleuze & Guattari and Levi-Strauss offer binary systems characterized by their opposing dictums on aspects such as homogeneity, heterogeneity and problem-solving. There are important differences between the theories of science proposed by Deleuze & Guattari and Levi-Strauss. An important divergence is to be found in these theorists' respective thoughts on chronology. Levi-Strauss (1972) argues for a linear

progression from a prevailing tradition concomitant with bricolage to one characterized by a concentration on engineering:

> "[Bricolage] was necessarily restricted by its essence to results other than those destined to be achieved by the exact natural sciences but it was no less scientific and its results no less genuine. They were secured ten thousand years earlier and still remain at the basis of our own civilization. There still exists among ourselves an activity which on the technical plane gives us quite a good understanding of what a science we prefer to call 'prior' rather than 'primitive', could have been on the plane of speculation".
>
> (Levi-Strauss, 1972, p. 16, Original Emphases)

Deleuze & Guattari (2004, p. 262) criticize a focus on linearity in the philosophical study of the development of humanity. For them, "to become is not to progress or regress along a series". Deleuze & Guattari and Levi-Strauss also differ in their respective view on the *structure* of their philosophies of science. As noted, Levi-Strauss was a structuralist thinker. Structuralists believe that humans are too entrenched in their existence to be able to hold facets of it up for philosophical scrutiny (Barthes, 2000). In order to make intellectual interrogation possible, structuralism denotes that theorists must create a simulacrum of a facet of existence to make it intelligible and open to examination (Barthes, 2000). On this point Barthes (2000, p. 215) states the "imitated object makes something appear which remained invisible, or if one prefers, unintelligible in the natural object." Structuralist activity proceeds through the comparison and contextualization of similarities and differences between simulacra. In order to achieve this, such structures (simulacra)

must have distinguishable boundaries. Indeed, Barthes (2000, p. 216) argues these imitations of existence have “no significant existence except by their frontiers: those which separate them from other actual units of the discourse”. Accordingly, Levi-Strauss develops the simulacrum of bricolage in relation to its binary Other, engineering.

Rather than being structuralists, Deleuze & Guattari operate in a tradition which has come to be termed post-structuralism (Dillon, 2000). Poststructuralists tend to critique the rigidity of boundaries to schema implied in structuralist philosophy, instead poststructuralism “offers the last word, not in terms of definition, but in terms of irresolution” (Miller, Whalley & Stronach, 2005, p. 313). Deleuze & Guattari’s (2004, p. 261) frustration with structuralist methodology is illustrated below:

> “When structuralism encounters […anomalies…] pervading a society, it sees them only as phenomena of degradation representing a deviation from the true order…”

Deleuze & Guattari (2004, p. 262) claim structuralism’s tendency to delineate simulacra compromises philosophical enquiry:

> “It is always possible to try to explain these […anomalies…] by a correspondence between two relations, but to do so most certainly impoverishes the phenomenon under study”. (Original Emphasis)

Instead of focusing on firmly bound simulacra, Deleuze & Guattari (2004, p. 524) propose a continuous transition between the smooth space of minor science and the marked space of its royal counterpart:

> "…smooth space is constantly being translated, transversed into a striated space; striated space is constantly being reversed, returned to a smooth space".

Deleuze & Guattari's (2004) position is important in justifying the choice of theory underpinning the analysis in this paper. There does not appear to be a linear chronological 'evolution from' one of Law's (2011) UX research camps 'into' the other. This observation is at odds with Levi-Strauss' explanation of the development of bricolage and engineering (namely that the latter grew from the former) and consistent with Deleuze & Guattari's description of the non-linear relationship between minor science and royal science. Deleuze & Guattari's thoughts on a non-linear transition (a flux or flow) between spaces occupied by minor science and those claimed by royal science will become important in the next sections of this paper.

Through spotlighting the important areas of 'reduction', 're-prioritising' and 'following' , the following section argues (1) that the model-based UX research community can be constructed as practitioners of royal science and (2) that design-based UX researchers can be constructed as minor scientists.

Design-Based UX Researchers as Minor Scientists

Reduction

In the 1980s and 90s, the notion of “usability” grew in influence in design research and practice (Koskinen, Zimmerman, Redstrom, & Wensveen, 2011). This movement was underpinned by a focus on empiricism: for Norman (2002, p. 38) usability “takes root in the cognitive sciences [...and…] prides itself on its scientific basis and experimental rigor”. This stance is derived from evidence that measuring human data leads to successful design interventions. Dix, Finlay, Abowd & Beale (2004, p. 24) for example, note that “the human ear can hear frequencies from about 20 Hz to about 15kHz”. For these authors, a failure to consider human factors causes design failure. Accepting that differences exist in levels of cognition inside a population, Dix et al. (2004, p. 52) recommend categorising humans, for “the majority of people” fall within a certain range of observed values.

As previously noted royal science measures and marks all space with increments. Through this process, Deleuze & Guattari (2004, p. 407) argue it “extract[s] constants from variables”. As also noted, these increments are developed through advocates of royal science making use of maxims created by royal scientists. To recall, Deleuze & Guattari term these axioms “forms”, stating royal science’s models signify “a form that organizes matter” (P.407). Earlier, it was also stated that royal science homogenises matter in an attempt to make it fit into specified theoretic models. Deleuze & Guattari argue this matter “is prepared for the form” (p.407). For the usability movement, human data can be perceived as *matter*. The usability model is concerned with measurement, statistical analysis and ‘organising’ human data into its constructs of ‘normal’ and ‘abnormal’. These constructs can be thought of as

forms. Consequently, in the usability model, *matter is prepared for the form*. The precepts of usability can thus be seen as analogous to those of royal science.

The shift towards user experience followed criticism of approaches solely concerned with usability. Usability designers were, for example, accused of ignoring emotional factors in the creative process and in-so-doing tolerating the development of unattractive objects (Norman, 2002). The 'Experience Economy' (Pine & Gilmore, 1999) has influenced the shift away from a concentration on pure functionality in user-centred design (Jetter & Gerken, 2006). UX researchers claim to have moved beyond a reliance on the precept of functionality through considering felt aspects of interaction such as enjoyment or fulfillment (Sharp, Rodgers, & Preace, 2007). In an attempt to elicit more relevant data relating to users, qualitative methods have become a prominent feature of UX research (Bargas-Avila, & Hornbæk, 2011). However, the evaluative methodology employed by UX investigators is predominantly derived from usability models (Sengers, 2010; Tullis & Albert, 2008). This paper began by outlining Law's (2011, p. 4) characterization of UX research practice into "roughly" two catchments, the "model-based" and "design-based" camps. It is worth recalling that the former utilise intellectual methods derived from usability practitioners when interpreting qualitative human data for measurement [0]. It follows that for the model-based UX research community, "measurability" provides a central link with its predecessor. Sharp, Rodgers & Preece (2007) for example, promote the value of cognitive science in describing the capabilities and limitations of users. Model-based UX researchers claim the measurability of "ambiguous" qualities such as beauty (Lavie & Tractinsky, 2004; Hassenzahl, 2004) and trust (French, Liu, & Springett, 2007). Beyond this, Law (2011, p. 6) claims that all "…qualitative data

can be coded, counted and, so, quantified, being conducive to computational manipulations".

Royal science aims to create constructs with universal applications (Deleuze & Guattari, 2004). The model-based camp's belief in the measurability of all human data suggests a parallel with this imperial science. It is worth returning to Deleuze & Guattari's (2004, p. 407) claim that the royal science model specifies a "form that organizes matter and a matter that is prepared for the form". Royal science's model relies on the reductive processing of data (Marks, 2004). For model-based UX researchers, human experiences can be perceived as *matter*. In model-based research, the method of reduction via quantification can be considered as the *form* organising this matter. For model-based researchers, all human experiences are *prepared for the form* of reduction via quantification. Thus, the precepts of the model-based camp can be considered as being analogous to those of royal science.

Evaluative techniques which utilise "rationally deduced metrics" dominate in HCI (Sengers, 2010, p. 4). Their efficacy is questioned by design-based UX researchers. Examples of design-based investigators' criticism of rational instrumentalism are presented below. McCarthy & Wright (2004, p.24) criticise the elevation of rationality in the study of UX above "being and participating". In their work on cultural probes, Gaver, Boucher, Pennington & Walker (2004, p. 56) caution against scientific analysis of user data for fear of "blunt[ing]" the connection between designer and user. Indeed, Gaver co-developed cultural probes in part to subvert normal HCI research practice (Boehner, Vertesi, Sengers, & Dourish, 2007). Koskinen et al. (2011, p. 42) caution against reductionism, arguing that "design and design research

will fail if they are reduced to a formula". For Forlizzi & Battarbee (2004, p. 265), human emotions are "hard to understand, let alone quantify". **(Details removed for review)** argue quantitative measures "can miss some of the insights available in accounts that resist such reduction". Similarly, Olivier and Wallace (2002) argue that reducing users' experiences to a set of immutable data can diminish the value of human heterogeneity. Going further, Matthews, Stienstra & Djajadiningrat (2008, p. 59) claim felt experience contains "no core platonic essence" and is thus irreducible to evaluation via rationally deduced metrics.

From such perspectives human experience cannot be '*boxed in'*. Utilizing Deleuze & Guattari's (2004) terminology, it is matter that is not *prepared for the form* of reduction via quantification—the model stipulated by royal science. Unlike the homogeneous space of state science, Deleuze & Guattari (2004, p. 409) argue "heterogeneous…space" is open to a "nonmetric" construction for it inhabits territory "without 'counting' it". Design-based researchers can be construed as claiming to *preserve the singularities and heterogeneity of human experience*. In this sense, design-based researchers can be considered—in Deleuze & Guattari's terms—as minor scientists. This is of more than academic interest. For a number of academic and industrial researchers royal science tends towards determinism which conceives of progress primarily in terms of technological advances. Efforts to alter these *priorities* are discussed below.

Re-prioritising

“Technological determinism” is an approach to product or service development which privileges the position of technology (Matthews et al., 2008). Calling this an “invention-centric approach”, Prestero summarises the process:

> “the inventor begins by specifying the technology that they think will solve the problem…[]…they then go in search of a specific user group or market segment for which the product is a match”
>
> (The International Council of Societies of Industrial Design n.d, unpaged)

It has been argued that the usability model in HCI is unperinned by technocentricism. Sengers (2010, p. 4) for example claims that “technoscientific reasoning” is prevalent in HCI and argues that the field still perceives progress in terms of technological advancement. In Deleuze & Guattari’s terms people for whom products are created can be perceived as *matter*. Rules determined by a technocracy can be thought of as *forms*. As a function of technological determinism, people for whom products are created can be considered as being *fitted* into the stipulations generated by technocratic rule. Consequently, the technological determinism precept can be suggested as correlating with Deleuze & Guattari’s (2004, p. 407) description of royal science as a model that “implies a form that organizes matter” and “matter that is prepared for the form”.

Philips Design (1997, p. 10) argue that rather than benefitting humans, technological determinism has contributed to a reduction in “personal happiness” in society. Sengers (2010) questions the legitimacy of technological determinism and the “universalist models” predominantly utilised by the HCI community. According to

Bardzell (2010), dominant HCI models have produced notions of the “ideal user” and pressurize people in to adopting identities they do not want in order to use design interventions successfully. For Satchell (2010), this model-based approach denies the heterogeneity of female users of digital technology. In ‘making people unhappy’, ‘pressurising users’ and ‘denying difference’ the above arguments suggest HCI – through privileging technology over people – has got its priorities wrong.

Dunne (1999) believes that design can disrupt the technocracy consumers find themselves in and that through this endeavour, they can be re-humanised. Good design, according to Wright & McCarthy (2008), does not begin with precepts. Rather than being initiated through specifying technology, Prestero, (The International Council of Societies of Industrial Design, No Date) claims that good design “starts with the user and then goes in search of the technology”. Similarly, according to Holt (2011, p. 153), an approach which begins with users challenges the model-based approach and “de-institutionalizes” the design process. In claiming that people should come first in product development, design-based researchers suggest a need for re-prioritisation in HCI.

Such calls from design-based investigators resonate with Deleuze & Guattari’s description of minor science as a model that recognizes:

> “...the vital state of matter...[]...a material vitalism that doubtless exists everywhere but is ordinarily hidden or covered unrecognizable, dissociated by the [...royal science…] model.”
>
> Deleuze & Guattari (2004, p. 454)

The notion of putting people first *and then hunting* for appropriate technology necessitates *following technological matter*. 'Following', as already noted, is important to the call driving the nomad scientist. The next section will outline how the concept of "following" is significant in the construction of the design-based UX research camp.

Following

Suchman (1995) argues that ethnography has been introduced in design practice to counteract reductionism. Design agencies began employing ethnographers in the 1970s (Wasson, 2000). According to Wasson (2000, p.382) "by 1997, every major design firm claimed to include ethnography as one of its approaches". 'Cultural Probes' have emerged as a popular method of gathering qualitative data. The term Cultural Probes denotes a collection of objects designed to engage users early on in the design process (Boehner, Vertesi, Sengers, and Dourish, 2007). As opposed to large-scale, time consuming methods, this ethnographic method is deployed when "broad and rapid data is desired" (Paulos and Jenkins, 2005, p. 342). Gaver et al. describe the process for recruiting participants for a research study employing probes below,

> "We made no attempt to control demographics, but our volunteers came from a wide range of circumstances: from ages 18 to 80, rich and poor, families, single people, and housemates; they represented a wide range of the home lives of people in today's society".

Gaver et al. (2004, p. 54)

Through giving up control of the study demographic, Gaver et al. can be seen as distancing themselves from royal science, a practice which persistently strives to "striate all of space in all of its directions" (Deleuze & Guattari, 2004, p. 408). Gaver et al. (2004, p.54) criticise "researchers' tendency to apply their own conceptual frameworks to the phenomena they observe". In-so-doing they can be posited as opposing royal scientists' tendency to both create "a form that organizes matter" and to understand matter as an entity "that is prepared for the form" (Deleuze & Guattari, 2004, p. 408). Gaver et al.'s stated unwillingness to dictate the demographic of participants or to impose order over the evaluative framework suggests an interest in pursuing the heterogeneous flow of material. Their philosophy can thus be compared with that of minor scientists who operate through "following a flow of matter" (Deleuze & Guattari, 2004, p. 451).

Suchman (1995, p.59) argues that ethnography has been adopted in an attempt to counteract "the distance of professional designers from the sites and activities that are the subjects/objects of their work". However, she notes that "traditional ethnography" (p. 63) has been criticised for creating an opposition between researcher and studied subjects with the result of objectifying and Otherising the latter. For researchers utilising traditional ethnography, this approach can be constructed in terms of the practitioner following users *up until a certain point* where upon he is ultimately curtailed by what might be termed an impenetrable 'terminal distance' between himself and his subject. To further evidence the claim that design-

based UX researchers can be constructed as minor scientists, it is important to detail how Deleuze & Guattari expand their description of the process of following:

> “[Minor scientists]... are obliged to follow in another way as well, in other words, to go find the wood where it lies, and to find the wood with the right kind of fibers. Otherwise, they must have it brought to them: it is only because merchants take care of one segment of the journey in reverse that the …[minor scientists]… can avoid making the trip themselves. But…[minor scientists]… are complete only if they are also prospectors; and the organization that separates prospectors, merchants, and artisans already mutilates artisans in order to make "workers" of them”
>
> (Deleuze & Guattari, 2004, p. 451-452)

To be a more *complete* minor scientist then, an individual cannot be thwarted by a terminal distance between himself and the matter he is pursuing. Equally, d*istance* between practitioners and people being studied appears to be an issue which should be overcome in design-based UX research.

Gaver et al.’s (2004) efforts to reduce distance are discussed below. Gaver et al. (2004, p. 55) identify distance between themselves and their research participants, stating their latter were “inescapably...[ ]...different” from them. In an attempt to comprehend data provided by participants Gaver et al. (2004, p. 56) claim “[we had to] see the volunteers through ourselves”. Gaver et al. (2004, p. 55) argue their methodology precipitated the creation of a “dialectic” between themselves and their study group. This in turn created reduced the distance between these parties to an

“intimate” one (Gaver et al., 2004, p. 55). Similarly, in highlighting the oppositional roles adopted by both parties, Light (2010) identifies distance between researcher and participants. Light (2010, p.5) suggests researchers would benefit from perceiving their interaction with study protagonists as a “meeting place”. For Light, this stance counteracts protagonists’ tendency to Otherise one another, for “unlike an opposition, [it] doesn’t need a One to respond to” (p. 5). Light’s ‘meeting place’ can also be seen as a strategy to reduce the distance between researcher and participant. Equally, IDEO (Brown & Wyatt, 2004, n.p.) identify a requirement for researchers to reduce distance between themselves and participants, stating “design thinkers become embedded in the lives of the people they are designing for”. Holt (2011, p. 152) suggests design-based research is ineffective if investigators remain distant from study participants as user-centred practices are unsuccessful if left to “occur solely on the level of representation”. Rather, in successful UX practice distance is reduced for the “designer absorbs and is absorbed by the user’s own situation” (Holt, 2011, p. 152). The UK Design Council (Burns, Cottam, Vanstone & Winhall, 2006, p. 18) argue UX design necessitates practitioners “immersing themselves” in the lives of users. This act of immersion also signifies the need for design-based researchers to reduce the distance between themselves and participants.

The requirement for design-based researchers to reduce distance between themselves and users parallels the need for Deleuze & Guattari’s (2004) minor scientist to erase distance between himself and the materials he works with.

There are then a number of ways in which Law's opposing camps of UX researchers mirror the philosophical distinctions outlined by Deleuze & Guattari in terms of royal and minor science. The comparison illustrates that the current debates in HCI are not new. Discussions framed through a lens provided by Deleuze & Guattari also serve to provide insight into the nature of legitimacy within contemporary HCI research. practice. The following section reflects on shifts in the use of the aforementioned ethnographic method termed 'cultural probing' to illustrate how legitimacy in HCI is framed.

On Legitimacy

Cultural Probes are now so commonly used in HCI that they are almost the default mode for researchers gathering qualitative data. They are seldom however deployed purely as 'cultural probes' but rather adapted in some way (Boehner, Vertesi, Sengers, & Dourish, 2007). Gaver et al. (2004) warn against the loss of attributes such as uncertainty and ambiguity which are central to the inception of probes through their incorporation into the repertoire of this community. Going further, Boehner et al. claim this appropriation can easily dismantle the true purpose of these tools:

> "The subversive nature of the original probes is often lost, however, when they are seen as a reproducible method and explained within traditional accounts of knowledge production in user-centered design. What we see, then, is the probes being adopted within the frame of existing HCI approaches, and particularly in light of a traditional conception of the relationship between users, requirements, designers, and designs".

(Boehner et al., 2007, p. 1081)

In Deleuze & Guattari's (2004) terms, the tendency to remove 'uncertainty' from the probes process parallels royal science's fondness for 'extracting constants from variables' and the subsequent 'homogenisation' of space and matter. As probes become a less ambiguous method, they can be considered as becoming *forms*. Probes then take on a royal scientific description, becoming "a form that organizes matter" (2004, p. 407).

For Deleuze & Guattari, royal science appropriates the inventions of minor science to enforce its dominance. These creations are "always formalized" by state science which allows them to "exist only in the capacity of 'technologies' or 'applied science'" (2004, p. 411). The "reinvention" of cultural probes is an example of a minor scientific methodology re-conceptualised as a royal scientific "technology". For design-based researchers, this process robs probes of their legitimacy. However, the opposite is true for their model-based counterparts – for it is only by making probes submit to their model that it can become a truly legitimate tool.

UX research practitioners are not necessarily lifelong members of either the model-based or design-based camps. According to Law (2011, pp. 4-5), the movement of individuals does not occur with equal frequency in both directions: "migration between the two camps, especially from the former to the latter, seems on the rise". It may be that large numbers of 'holistic' UX researchers have, upon studying disinterested, evidence-based observations, realised that their philosophy is incorrect and accordingly switched sides. There may however be other explanations

for this phenomenon. UX researchers are concerned with disseminating findings. The majority of papers in leading HCI conferences and journals feature the presentation of empirical data (see Law, 2011). It is not unreasonable to suggest this may lead design-based researchers' decision to incorporate traditional HCI data evaluation methods into their repertoire and thus to move towards affiliation with the model-based camp.

This interplay between UX camps parallels that seen between royal and minor science.

The royal and minor sciences do not share similar statuses. Royal science dominates, "continually impos[ing] its form of sovereignty on the inventions of nomad science" (Deleuze & Guattari, 2004, p. 400). Furthermore, state science, "deprives...[]... [the minor sciences] of their own model, submit[ting] them to its own model" (Deleuze & Guattari, 2004, p. 411). Through setting parameters for dissemination, the model-based camp may be 'imposing their sovereignty' and requiring design-based researchers to 'submit to their own model'. In HCI then, an overarching sense of legitimacy is dictated by the model-based camp. Though writing before the advent of UX research, Deleuze & Guattari (2004, p. 400) may have foretold the predicament for minor scientists in HCI research practice:

> "It is as if the "savants" of nomad science were caught between a rock and a hard place, between [… what…] nourishes and inspires them and the State that imposes upon them an order of reasons".
>
> (Deleuze & Guattari, 2004, p. 400)

The parallels between the models of royal and minor science and Law's (2011) camps in UX research practice highlight difficulties faced by design-based investigators. Earlier, the concept of ***flux*** between Deleuze and Guttari's schemas of science was noted. Further issues are identified through re-vising the existence of flux.

On Fluidity

Despite its dominance, royal science cannot dissuade all minor scientists from their practice (Deleuze & Guattari, 2004). In some instances it acquiesces, "even going so far as to propose a minor position for them within the legal system of science and technology" (Deleuze & Guattari, 2004, p. 411). This might be termed a 'seat at the table' approach. Does this mean that methods such as cultural probes have given design-based researchers a high level of legitimacy in the eyes of the dominant model? Deleuze & Guattari's work suggests that the answer is not at all straightforward. It is worth returning to their claim that:

> "…smooth space is constantly being translated, transversed into a striated space; striated space is constantly being reversed, returned to a smooth space."
>
> (Deleuze & Guattari, 2004, p. 524)

The example of cultural probes are emblematic of this, they began as a means to subvert normal HCI research practice (Boehner et al, 2007). They can thus be constructed as a type of smooth (minor scientific) space emerging from a striated

(royal scientific) one. As cultural probes were translated in to a ‘striated space’ through their appropriation by model-based researchers it is understandable that the design-based camp is making efforts to ‘smoothen’ them. It is possible that the continued appropriation of cultural probes by model-based researchers may result in a time when it is impossible for design-based researchers to reclaim this tool. In this case, it may not be possible for the model-based camp to ‘smoothen’ the space occupied by probes to a desirable degree. Consequently, the design-based contingent may focus on emerging ‘unmarked’ methods giving rise to new vehicles through which the notion of legitimacy in HCI can be debated. Finally, if Law (2011) is correct in arguing that the UX field is becoming populated with model-based practitioners, then one cannot escape the implication that this research space is becoming increasingly striated. In such an event, the design-based contingent may ask “what smooth space lies beyond UX”?

Conclusion

This paper has argued that model-based and design-based UX research camps can be constructed in terms of the philosophers Gilles Deleuze & Felix Guattari’s *royal science* and *minor science* respectively. In defending this position, this research has found flaws with design-based UX researchers’ attempts to identify with Claude Levi-Strauss’ bricoleur. Has Insodoing, we this research has calls for a re-evaluation of the use of bricolage as a means of contextualizing qualitative research practice—this call is important as the idea of bricolage is commonly used by qualitative researchers in a variety of fields.

In viewing the model-based and design-based UX research camps through a lens provided by Deleuze & Guattari, it is important to note that we have not attempted to present an easy caricature of the two fraternities of user experience research. Model-based researchers are quick to point out that they are well aware of the difference between the map and the territory, the menu and the meal. Similarly, design-based researchers know very well that the world in which they live and the technologies they use depend on model-based development.

In constructing competing camps in UX research in terms of the philosophy of Deleuze & Guattari, it is possible to note that rather than a rigid dichotomy in HCI research practice there exists a flux. Three decades ago an overarching concern with the functionality of technology prevailed in HCI. As the dominant model, it can be thought of as royal scientific approach. In the 1980s, the usability movement inspired researchers to focus on how easily human beings could operate computerized technology. Consequently it presented a human-centered challenge to the overarching approaches of the time drawn from engineering and computer science. At the time, the usability movement had minor scientific traits. However, for contemporary holistic UX researchers, usability itself seems like a royal science.

The notion of flux is intrinsic to the relationship between Deleuze & Guattari's sciences. Debates precipitated by the continuous flux between model-based and design-based researchers will continue to emerge. The use of Deleuze & Guattari's models may enable researchers to contextualize these shifts in discussion. The use of Deleuze & Guattari's philosophy enables the formation of insights into how the philosophy of technology is framed.

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